

**ABSTRACT**

An apparatus for synthesizing polymer chains includes a controller, a plurality of precision fit vials circularly arranged in multiple banks on a cartridge, a drain corresponding to each bank of vials, a chamber bowl, a plurality of valves for delivering reagents to selective vials, and a waste tube system for purging material from the vials. A purging operation can be selectively performed on one or more of the banks of vials. The multiple banks of valves provide an additional number of reagent choices while operating in a serial mode and faster reagent distribution while operating in a parallel mode. The plurality of vials are stored in the cartridge and are divided among individual banks wherein each bank of vials has a corresponding drain. There is at least one waste tube system for expelling the reagent solution from vials within a particular bank of vials when the waste tube system is coupled to the corresponding drain. The cartridge holding the plurality of vials rotates relative to the stationary banks of valves and the waste tube system. The controller rotates the cartridge and operates the banks of valves and the waste tube system in response to the required sequence of dispensing various reagent solutions and flushing appropriate vials in order to form the desired polymer chain within each vial.